<table>
<tr><td>NAME OF THE COURSE</td><td colspan="6">Numerical Methods in Physics and Engineering</td></tr>
<tr><td>Code</td><td>PMP275</td><td>Year of study</td><td colspan="4">GU-1</td></tr>
<tr><td>Course teacher</td><td>Dragan Poljak, PhD, Professor</td><td>Credits (ECTS)</td><td colspan="4">5,0</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Dragan Poljak, PhD, Professor</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>45</td><td></td><td>15</td><td></td></tr>
<tr><td>Status of the course</td><td>Elective</td><td>Percentage of application of e-learning</td><td colspan="4"></td></tr>
<tr><td colspan="7">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="6">Training students for:
- Understanding and apply fundamental principles of numerical modeling in physics and engineering,
- Formulating and solve simple problems in physics and engineering by means of modern numerical methods,
- Permanent adopting and fostering the knowledge in the area of numjerical modeling,
- Applying of numerical methods to solve problems in classical electrodynamics, thermodynamics, bioelectromagnetics, plasma physics, magnetohydrodynamics and quantum physics.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="6">Basic undergraduate courses of mathematical analysis and general physics.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="6">Students will be able to:
1. Define fundamental principles of numerical modeling,
2. Apply numerical methods to solve one-dimensional static and dynamic problems
3. Apply numerical methods to solve two-dimensional static engineering problems
4. Compute frequeny response of physical system by means of Finite Difference Method (FDM) and Finite Element Method (FEM)
5. Develop simple codes based on numerical methods to solve problems in electrodynamics, thermodynamics and quantum physics
6. Use commercial software packages based on numerical methods for solving problems in physics and engineering</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">(3h)Introduction to numerical modeling. Source and field concepts. Differential and integral approach to solve problems in science and technology.
(3h) Classification of numerical methods. Analysis in the ferquency and time domain.
(3h) Domain and subdomain methods
(3h) Domain discretisation methods.Boundary discretisation methods.
(3h) Overview of numerical methods; Finite Difference Method (FDM).Finite Element Method (FEM). Boundary Element Method (BEM).
(3h) Introduction to Finite Difference Method (FDM).
(3h) Finite Difference Method (FDM): One-dimensional and two-dimensional static problems.
(3h) Finite Difference Time Domain (FDTD) method: one-dimensional problems.
(3h) Introduction to Finite Element method (FEM)
(3h) Finite Element Method: One-dimensional and two-dimensional static problems.
(3h) Finite Element Method in the time domain: One-dimensional problems.
(3h) Introduction to Boundary Element Method (BEM). Static and quasistatic problems.</td></tr>
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	(3h) Integral equation methods (source methods). Introduction to the Method of Moments (MoM). (3h) Application of numerical methods in classical electrodynamics, bioelectromagnetics, magnetohydrodynamics (3h) Application of numerical methods to plasma physics and quantum mechanics.

Format of instruction	☒ lectures ☒ seminars and workshops ☒ exercises ☐ on line in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☐ multimedia ☐ laboratory ☐ work with mentor ☐ homework assignments
Student responsibilities	The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*

Name	Ects	Name	Ects	Name	Ects
Class attendance		Research		Experimental work	
Oral exam	2	Report		Homework assignments	
Seminar essay	3	Essay			
Tests		Practical training			
Written exam		Project			

Grading and evaluating student work in class and at the final exam	Seminar and final oral exam.

Required literature (available in the library and via other media)

Title	Number of copies in the library	Availability via other media
[1] D.Poljak, Teorija elektromagnetskih polja s primjenama u inženjerstvu, Šk. knjiga Zagreb, 2014.	0	
[2] D.Poljak i dr., Numeričke metode u elektrotehnici – interna skripta, FESB-Split 2006.	0	
[3] D.Poljak, V.Dorić, S.Antonijević,: Modeliranje žičanih antena primjenom računala . Zagreb, Kigen d.o.o., 2009.	0	

Optional literature (at the time of submission of study programme proposal)	[1] D. Poljak, Advanced Modeling in Computational Electromagnetic compatibility, Wiley Interscience, New York 2007.
Quality assurance methods that ensure	Evaluation of results in accordance with the above learning outcomes Feedback from students via surveys Self-evaluation of teachers

the acquisition of exit competences	Institutional and non-institutional evaluations
Other (as the proposer wishes to add)	